

Wayne Stroessner Questions

1. I've been told by Wisconsin Electric staff that their new coal powered plants will use "state of the art technologies". Just what does this mean when research is still in its infancy (DOE's website indicates we MIGHT be able to burn coal "cleanly" in 15 to 20 years)?

The following is what WEPCO is proposing. The application is not yet complete and more information will be forthcoming.

WEPCO has proposed to construct two supercritical pulverized coal fired boilers. The term supercritical defines a specific range of temperature and pressure in the boiler that are above the critical point of water. The critical point for water is 3,208 pounds per square inch absolute and 705 degrees F. This high temperature and pressure result in very high operational efficiencies. The NOx emissions are expected to be 10% lower than the regular pulverized coal fired boilers.

WEPCO will also be installing advanced FGD technology for SO2 control and SCR system to reduce NOx emissions.

WEPCO is also proposing to construct two IGCC units and these units are considered the cleanest coal based power plants with very low emissions of SO2 and NOx. The IGCC systems involve gasification of coal, cleaning the gas and combusting it in a gas turbine generator to produce electricity. Residual heat in the exhaust gas from the gas turbine is recovered in a heat recovery boiler as steam that can be used to produce additional electricity in a steam turbine generator. Sulfur, nitrogen compounds and particulates are removed before the gas is burned in the gas turbine.

In the gasifier, the sulfur in the coal is released in the form of hydrogen sulfide, which is readily removed. By product are salable sulfur or sulfuric acid. Sulfur removal exceeds 99.9%. High levels of nitrogen can also be removed. Some of the coal's nitrogen is converted to NH3 that can be almost totally removed. NOx formed in the gas turbine can be held to well within allowable levels by staged combustion or by adding moisture to control flame temperature.

2. What does the oxymoron "clean coal" mean technically? (The term has been used by the industry in many of their ads for providing energy for the future)

This term has always been associated with the U.S. DOE's "Clean Coal Technology" Program. I'm not aware that it relates to specific technology.

3. The mercury cycle from coal to uptake in fish is well documented, but what happens to the mercury when fish die in the water from old age, injury, etc.? Does the methyl mercury return to the sediments to begin the cycle all over?

In many of the low productivity lakes where Hg bioaccumulation is a problem, the fish biomass is relatively low. Therefore, the flux of Hg from dead fish is also relatively low

when compared to the other sources of input, e.g., atmospheric, watershed. Nick Bloom of Frontier Geosciences has been interested in this question and he did allow some fish to decay in a laboratory study and measured the fate of the Hg in the decaying fish. His study measured dimethyl-Hg, elemental-Hg and monomethyl-Hg released from the decaying fish. Intuitively one would think that there would be some methyl-Hg recycled back into the aquatic ecosystem. There is a law of diminishing returns that would eventually take effect. If the Hg loading to a lake were to cease, the amount of Hg recycled from decaying fish would eventually be minimal as dimethyl-Hg and elemental-Hg are both very volatile and would rapidly evade from the lake surface to the atmosphere (answer provided by Doug Knauer).

4. The last question on CAC Notes/Comments/Questions for 11/16/01 was not answered satisfactorily. The question was: [How can anyone explain the statement “Ultimately, regional reductions in mercury emissions will be needed to improve water bodies in the state.”? The release of any mercury only adds to the amount of mercury in our water bodies. Only the rate of increase is reduced...The total quantity is still increasing.]

This was on the list of questions posed to the Technical Advisory Group. Their responses will be sent to the CAC on January 14th.

The WDNR believes that sources outside the state contribute mercury deposition to Wisconsin waters. We are in the initial stages of developing a modeling system that will help us understand regional sources and deposition. Similar to ground level ozone and acid deposition, mercury is an air quality problem that will likely require emission reductions from sources in our neighboring states, and perhaps from a larger geographic region, to help us achieve a mercury level in fish in Wisconsin waters that eliminates consumption advisories. One reason that we are initiating a state regulation is to demonstrate to others that we are willing to initiate actions to get mercury reductions from our own facilities. Other states are also taking actions to reduce mercury air emissions. This should place Wisconsin and other states in a credible position to advocate for effective mercury emission reductions on a national level.

5. Just what is “washed coal” and how can that reduce the amount of mercury emitted when it is burned?

It is a technology that can be used to remove mercury at the mine source. The TAG will be providing additional information.

6. With the rapid development of fuel cells and a hydrogen economy, might other, clean alternatives take precedence rather than construction of more coal burning plants - one of the dirtiest of all centralized electric power generating plants?

The proposed rules do not require specific technologies. The proposed rules do require new mercury sources to offset their emissions at a 1.5 to 1.0 ratio. If implemented this may force consideration of lower mercury emitting technologies to generate electricity. In addition, comments we have received from some utilities express concern that the

stringency of the reduction requirements in the proposed rules will force them to abandon coal burning and move to cleaner fuels and cleaner technologies at a great cost.

7. If I were an outsider and only read the minutes and summaries of both TAG and CAC meetings, it would appear that TAG is waiting for CAC to do something and vice versa. Was this process intended? (It certainly does not permit speed and efficiency.)

No. The focus of the groups was intended to be different but compatible in effort and schedule. The Technical Advisory Group is developing technical briefs that address significant technical issues in a neutral manner. The TAG started their work in advance of the CAC with the hope that they would have technical briefs available to the CAC in a timely manner.

8. The simple answer “Yes” to the question: “Can TAG provide us with information on the amount of Hg in fluorescent lamps?” certainly does not provide CAC with answers that we’d like to know. Please show us the values!

The following is from the National Electric Manufacturers Association (<http://www.nema.org/lamprecycle/>):

How much mercury do lamps contain? Based on a 1999 NEMA survey, the average four-foot fluorescent lamp contains about 11.6 milligrams (mg) of mercury (453,592 milligrams per pound). This number has been steadily declining as lamp manufacturers work to reduce mercury content to the minimum amount technically feasible without reducing lamp life. The average four-foot lamp today contains over 75% less mercury than the same lamp would have contained in 1985.

According to U.S. EPA, total global natural and manmade emissions to the environment are 5,500 tons. Manmade sources in the U.S. released 158 tons of mercury in 1995. For comparison, all the lamps sold in the United States in 1999 contain only an estimated 13 tons of mercury, of which only a fraction will be released as an air emission. Proper lamp disposal or recycling will result in keeping all of this mercury out of the environment.

9. I’m confused about estimated costs of the three phases of reduction. One of our earlier DNR releases showed costs would increase \$2.00/yr., \$4.00/yr. and \$9.00/yr. respectively. Part of the answer states: The TAG has not yet developed information on the availability and cost of Hg control however this work will be performed by the TAG. Isn’t this a contradiction?

The WDNR developed cost estimates for the technology we believed could achieve the phased reductions in the proposed rules last spring. Subsequent to that public comments raised questions about those estimates and the TAG is revisited the issue of costs and control technology.

10. An answer by Doug Knauer, WDNR Bureau of Research, states: “Mercury that becomes attached to bottom sediments is for the most part not very available for

methylation by bacteria.” Is this wishful thinking or has this been well documented? (PBC’s were likewise assumed to be bound up with bottom sediments until dredging was started.)

Hg attached to bottom sediments - Current thinking goes like this... Lake sediments are a sink for Hg inputs. 99% of mercury in lake sediments is in a solid phase. Only the 1% in the sediment pore waters is available to be methylated by sulfate reducing bacteria. The equilibrium rate between Hg in the solid phase and Hg in the pore water is not fully known. As the sulfate reducing bacteria in the sediments reduce the soluble sulfate concentration to a sulfide, the sulfides begin to compete for the available Hg and eventually 2 things occur: (1) the sulfate concentration is reduced to zero, thereby drastically reducing the production of methyl-Hg by the sulfate reducing bacteria and (2) the build-up of sulfides binds strongly with available Hg(II) in the pore waters and this sulfide-Hg bond keeps it from becoming bioavailable for any further methylation (answer provided by Doug Knauer).

11. Having a medical expert specializing in toxic reactions of Hg on humans, would certainly add credence to the TAG team. Is it possible to add such a member? (Any lay person can research resources, but having an health expert in the field would certainly be desirable.)

Yes it is possible. The issues the TAG will address do not bear on the question of public health. Several of the members of the TAG have good knowledge of health effects studies.

12. Are the proposed rules sufficiently stringent if Hg emission are permitted to be released into our environment? If those who prepared the proposed rules had family members who might be affected by mercury contamination, might they perhaps want to change the rule no matter what the cost?

This I believe is a question for the committee. The WDNR believes it is prudent to begin to reduce mercury emissions from state sources. Utilities in the state are also in agreement that reduction in mercury emissions is appropriate and are willing to take action.

13. Again, --- When will the TAG present us with the current research being done by national DOE - other than what can be found on their website?

Their work schedule will be presented at the January 9th meeting. It is likely that presentations on control technology will occur at the February 13th CAC meeting.